

Customer No.: 31561
Application No.: 10/605,345
Docket No.: 10232-US-PA

REMARKS

Present Status of Application

Claims 1-11 and 13-21 remain pending in the application. Claims 1-3, 7, 9, 10, 12-16, 18, and 19 are rejected under U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (AAPA) in view of Lu et al. (US Patent No. 6,440,836; hereinafter Lu). Claims 6 and 17 are rejected under U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (AAPA) in view of Lu and Cronin et al. (US Patent No. 6,140,703; hereinafter Cronin). Claims 4-5 and 20-21 are rejected under U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (AAPA) in view of Lu and Agarwala (US Patent No. 5,376,584). Claim 8 is rejected under U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (AAPA) in view of Lu and Kim et al. (US Patent No. 6,417,089; hereinafter Kim). Claim 11 is rejected under U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (AAPA) in view of Lu and Higdon et al. (US Patent No. 6,375,062; hereinafter Higdon).

Claims 1 and 13 have been amended for clarification purposes and for correcting informalities. Claim 23 has been added. Applicant believes that these changes do not introduce new matter and reconsideration of those claims is respectfully requested. In view of the above amendments and the following discussions, a notice of allowance is respectfully solicited.

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Discussion for 35 U.S.C. 103 rejections

Claims 1-3, 7, 9, 10, 12-16, 18, 19 and 22 are rejected under U.S.C. 103(a) as being unpatentable over AAPA in view of Lu. Claims 6 and 17 are rejected under U.S.C. 103(a) as being unpatentable over AAPA in view of Lu and Cronin. Claims 4-5 and 20-21 are rejected under U.S.C. 103(a) as being unpatentable over AAPA in view of Lu and Agarwala. Claim 8 is rejected under U.S.C. 103(a) as being unpatentable over AAPA in view of Lu and Kim. Claim 11 is rejected under U.S.C. 103(a) as being unpatentable over AAPA in view of Lu and Higdon. Applicant respectfully traverses the rejections for at least the reason set for below.

1. Claims 1 and 13 have been amended to improve clarity without changing the scope. Claim 23 further recites the features of the present invention. In the present invention, as described in related descriptions for FIG. 2F, the reflow process should be performed before the adhesive layer 214 is removed. For example, this adhesion layer can prevent the polymer layer 208 from reacting with the flux of the solder paste layer 224 to form air bubbles due to high temperature.

Further in FIG. 2G (par. [0034]; here, the paragraph sequence is based on the specification of E-filing version), since a material of the polymer layer 208 may be similar to the material of the patterned mask layer 220, such as the photoresist material layer, then

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the polymer layer 208 is still protected by the adhesion layer 214 without being damaged when the mask layer 220 is etched.

Further, the present invention is based on the printing process to fill the solder paste layer inside the second opening.

2. In comparing with AAPA and Lu, AAPA (see FIG. 1F and FIG. 1G), the first reflow process is performed without protection of the adhesion layer on the polymer layer 108. The photoresist layer 120 is directly removed from the polymer layer 108. This process of AAPA would damage the polymer layer 208.

Lu is cited in combination with AAPA, however, Lu in FIG. 3J still fails to disclose that the reflow process is performed while the adhesion layer 82 still remains. In addition, Lu never considers the situation when the polymer layer is further formed on the passivation layer 76 at all, therefore Lu apparently does not equally disclose the claimed features. Further, the etching process (col. 8, lines 60-63) is to remove the photoresist layer 110 with the layer 82, 96 without specific consideration the damage of the wafer, which may even have the polymer layer.

Further, the mushroom-shaped solder bump 120 can provide the evidence that the process is the electroplating process, and is not the printing process. Under plating process, the solder bump grows from the center of the opening and therefore locally

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extends to the top surface of the photoresist layer 100. For a printing process, as shown in FIG. 2E of the present invention, the height of the solder paste is about the same as the height of the mask layer 220.

Even further in Abstract of Lu (lines 15-20), the majority of the BLM layer is removed with the first, thin photoresist layer, so that, in the final BLM removal process, only a very thin adhesion layer 82 of the BLM layer needs to be removed and this *ensures a clean removal process without damaging the solder bumps*. Therefore, the adhesion layer 82 has to be very thin to prevent the damage on the bumps. This adhesion layer 82 of Lu is not used with the function to protect the polymer layer of the present invention from being etched and therefore does not equal to the adhesion layer of the present invention.

Further still, Lu apparently states that the two steps of solder reflow and adhesion layer etching may be reversed (col. 9, lines 14-17). This is then different from the present invention because the adhesion layer 82 has been removed before the step of solder reflow. In addition, this also means that the adhesion layer 82 of Lu is not equal to the claimed features with the unexpected results, as considered by the present invention.

Newly added claim 23 further recited the distinguishable features of the present invention.

For at least the foregoing reasons, Lu fails to disclose the missing features in

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AAPA.

3. With respect to dependent claims 4-6, 8, 11, 17, and 20-21, the Office Action further relied on the references Cronin, Agarwala, Kim or Higdon for teaching additional features recited in dependent claims.

Accordingly, the method of the present invention is patentably distinct from the prior art reference because AAPA or Lu, either alone or in combination, fails to disclose all limitations of independent claim 1 or 13. However, neither of the references Cronin, Agarwala, Kim or Higdon is unable to remedy the deficiencies of AAPA or the reference Lu. Therefore, it is respectfully submitted that claims 4-6, 8, 11, 17 and 20-21 patentably distinguish over the cited references, either alone or in combination, for at least the reasons stated above as well as for the additional features that these claims recite.

Therefore, reconsideration and withdrawal of these 103 rejections are respectfully requested.

For at least the foregoing reasons, Applicant respectfully submits that independent claims 1 and 13 patently define over the prior art references, and should be allowed. For at least the same reasons, dependent claims 2-11 and 14-21 and 23 patently define over the prior art references as well.

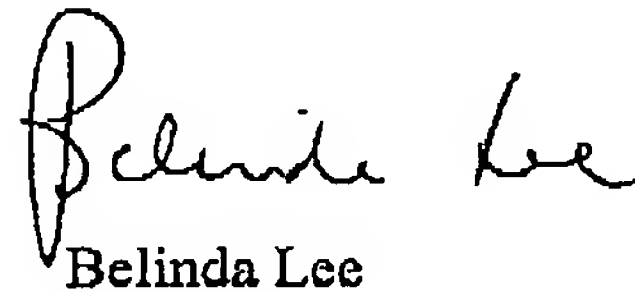
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CONCLUSION

In view of the foregoing, it is believed that all pending claims 1-11 and 13-21 and 23 are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

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Respectfully submitted,


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